Narumi NAKATO*: **Chromosome numbers of three endemic species of the fern genus *Blechnum* in Japan**

中藤成実*: ヒリュウシダ属の日本固有3種の染色体数

As the members of the genus *Blechnum* subgen. Lomaria, the following three endemic species have been described in Japan.

Blechnum niponicum (Kunze) Makino in Bot. Mag. Tokyo 11: 82, 1897.

Syn. *Lomaria niponica* Kunze in Bot. Zeit. 6: 508. 1848. *Struthiopteris niponica* (Kunze) Nakai, Rep. Veg. Daisetsu, 15, 1930.

Distr. Hokkaido, Honshu, Shikoku and Kyushu; common in lowland area, on banks and forest floors, up to 2500 m alt.

Blechnum amabile Makino in Bot. Mag. Tokyo 11: 83, 1897.

Syn. *Struthiopteris amabilis* (Makino) Ching in Sunyatsenia 5: 243, 1940.

Distr. Honshu, Shikoku and Kyushu; locally common, usually on rocks in mountain, up to 1500 m alt.

Blechnum castaneum Makino ex Makino et Nemoto, Fl. Jap. 1591, 1925.

Syn. *Struthiopteris castanea* (Makino) Nakai in Bot. Mag. Tokyo 47: 186, 1933.

Distr. Honshu; rare, restricted to mountain, on moist banks under deciduous forest, 900–2000 m alt.

Cytologically the gametic chromosome number was reported by Kurita (1965) for *B. niponicum* and *B. amabile*, and by Mitui (1966, 1986) for *B. niponicum*. In this paper, the somatic chromosome numbers are reported for the three species mentioned above.

Materials and methods The localities of the materials are listed in Tab. 1, together with the results of chromosome counts. For the somatic chromosome observations, the root tips were pretreated with 8-hydroxyquinoline solution for 3-5 hours and fixed in 45% acetic acid for 10 minutes. They were macerated in a mixture of 1N HCl and 45% acetic acid (4:1) for 1 minute at 60°C, and squashed in aceto-orcein. The voucher specimens are preserved in the National Science Museum, Tokyo (TNS).

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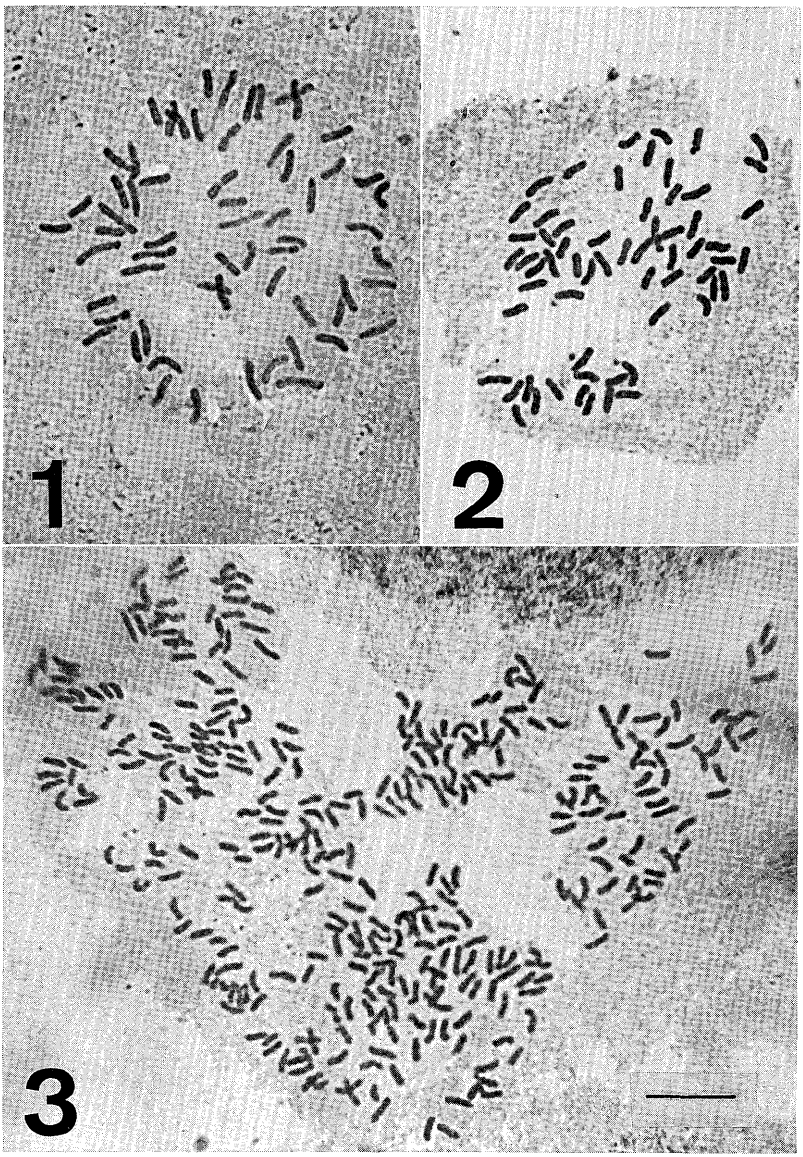
Tab. 1. Localities and chromosome counts.

Species and locality	Chromosome number	Voucher no. in TNS
Blechnum niponicum		
Higashiyamato, Tokyo Pref., 120 m	2n=62	469734
Okutama, Tokyo Pref., 280 m & 1200 m	2n=62	469735-6
Dentsuku-toge, Yamanashi Pref., 1900 m	2n=62	469737
Takayanagi, Niigata Pref., 200 m	2n=62	469738
Yugashima, Shizuoka Pref., 350 m	2n=62	469739
Hijirizawa, Shizuoka Pref., 1900 m & 2200 m	2n=62	469740-1
Kakeya, Shimane Pref., 440 m	2n=62	469742
B. amabile		
Asahi, Yamagata Pref., 640 m	2n=62	469743-4
Myoko, Niigata Pref., 1300 m	2n=62	469745
Kameyama, Chiba Pref., 180 m	2n=62	469746
Masutomi, Yamanashi Pref., 1150 m	2n=62	469747
B. castaneum		
Iide, Yamagata Pref., 1010 m	2n=340	469748
Asahi, Yamagata Pref., 960 m	2n=over 320*	469749
Myoko, Niigata Pref., 1550 m	2n=340	469750

* Accurate number could not be determined because of prophase plate.

Observations As shown in Tab. 1, nine plants of *B. niponicum* and five plants of *B. amabile* are all found to have 2n=62 (Figs. 1 & 2). In *B. niponicum*, the gametic chromosome number was counted to be n=31 by Kurita (1965) and Mitui (1966, 1986) using materials from Kikugawa, Shizuoka Pref., Owase, Mie Pref. and Isl. Yakushima, Kagoshima Pref. In *B. amabile*, the gametic number was reported to be n=31 by Kurita (1965) in plants from Ogasayama, Shizuoka Pref. The somatic chromosome number 2n=62 observed in this study for the two species is consistent with the previous meiotic count. Thus, it is clear that *B. niponcium* and *B. amabile* are diploid based on x=31.

Two materials of *B. castaneum* are confirmed to be 2n=340 (Fig. 3). The chromosome number of this species is here reported for the first time. This is the highest chromosome number in *Blechnum* next to *B. lehmannii*



Figs. 1-3. Photomicrographs of somatic chromosomes. 1. *B. niponicum*, 2n=62 (TNS no. 469734). 2. *B. amabile*, 2n=62 (no. 469743). 3. *B. castaneum*, 2n=340 (no. 469748). Scale, 10 μm.

from Honduras, showing n=198 (x=33) (Smith & Mickel 1977). Cytological studies on *Blechnum* have revealed that this genus is composed of aneuploidal series with the following basic chromosome numbers; x=28, 29, 31, 32, 33, 34 and 36 (Lovis 1977). Therefore, it is conceivable that *B. castaneum* (2n=340) is decaploid based on x=34, one of the base numbers so far reported for *Blechnum*.

Discussion From the present chromosome observations, the three endemic species in Japan can be divided into two cytological categories: 1) *B. niponicum* and *B. amabile* as diploid of x=31; 2) *B. castaneum* as decaploid of x=34. It is noted that *B. castaneum* have the unexpected high chromosome number, 2n=340. This species grows only in wet and shade places in montane regions of Honshu facing Japan Sea where snowfalls cover deeply in winter. It is likely that *B. castaneum* had been evolved by polyploidization and now survives as a relict species in Japanese mountain.

On the basis of morphological similarities, Löve & Löve (1966) asserted that *B. niponicum* was conspecific with *B. spicant* (L.) Roth distributed in Europe and North America, and described the European plants as "*B. spicant* ssp. *spicant*" and the Japanese and North American plants as "*B. spicant* ssp. *nipponicum*". However, *B. spicant* has been reported to be diploid with n=34 and 2n=68 from Europe (Manton 1950, Löve & Löve 1961, etc.) and North America (Wagner in Fabbri 1963, Löve & Löve 1966, etc.). The difference in chromosome numbers between *B. niponicum* and *B. spicant* does not support the taxonomical treatment by Löve & Löve (1966). It is concluded that *B. niponicum* is a distinct species and not conspecific with *B. spicant*.

On the other hand, Kondo (1929) pointed out that in sterile fronds stomata occur scatteringly over the pinnae except on veins in *B. spicant* and *B. castaneum*, while they occur in linear zones along both sides of the midrib in *B. niponicum* and *B. amabile*. The chromosome numbers and the distributional patterns of stomata indicate that *B. spicant* is more closely related to *B. castaneum* than *B. niponicum*.

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日本のヒリュウシダ属のシシガシラ亜属(シシガシラ属とする説もある)にはシシガシラ，オサシダ，ミヤマシシガシラの3種が知られていて，いずれも日本固有種である。これら3種の体細胞染色体を観察した。シシガシラとオサシダはともに 2n=62で，Kurita (1965) と Mitui (1966, 1986) の報告した n=31 と一致した。また，今回はじめて染色体数が明らかとなったミヤマシシガシラは，2n=340 であった。シシガシラとオサシダは x=31 の2倍体，ミヤマシシガシラは x=34 の10倍体とみなすことができる。このことから，ミヤマシシガシラと他の2種は別群に属すものと考えられる。また，ヨーロッパと北アメリカに分布する *B. spicant* は，多くの研究者によって n=34, 2n=68 と報告されている。染色体数から考えると，ミヤマシシガシラは *B. spicant* に近縁だと考えることができる。今まで外国では，日本のシシガシラを *B. spicant* のアメリカ型の亜種に含ませていたが，それは誤りであることを指摘した。

□神奈川県立博物館：**神奈川県植物誌分布図集シダ類・裸子類・単子葉類** 111 pp. 1986. 神奈川県立博物館，横浜. ¥1000 (送料別). 神奈川県植物誌編纂事業の中間成果の一部が刊行された。B 4 版を横に使い，1頁に9種類の分布図を示している。神奈川県の調査計画の特色として経緯度メッシュを用いず，人文地理的な観点から 105 の地区を分け，各地区の代表点に分布記号が記されている。データはすべてパソコンに集積され，これを整理したうえ，全部の種類について標本・文献・メモなどの資料源が示されている。これらの整理や作図はソフトウエアを工夫することによりなされたものである。電算機利用のこのようなデータ処理は，出力をながめて感じるよりはるかに多くの苦心が裏で払われているもので，資料収集に協力されている多数の方とともに，データ管理の当事者の努力に敬意を表する。入手希望者は大場達之氏に連絡されたい。 (金井弘夫)